Claims

1. Method for increasing the size of small particles for a condensation particle counter (20), in which method comprises the following steps

a) a particle containing aerosol flow is divided into a sample flow and a sheath flow,

b) the sheath flow is filtered in order to remove the particles contained in it

c) the filtered sheath flow is saturated with vapor,

d) the sample flow is introduced to the saturated sheath flow causing the vapor in the sheath flow to condense on the particles in the sample flow thus increasing the size of the particles,

characterized in that

the sheath flow is formed to a vortex flow in step c) which vortex-flow continues in step d) and the sample flow is introduced to the center of the vortex-flow of the saturated sheath flow.

2. Method according to claim 1, **characterized** in that the vortex flow is a spiral flow, that flows upwardly along the inner surfaces of the saturator (21) and/or condenser (22).

3. Method according to claim 1 or 2, **characterized** in that the sheath flow in step c) is formed to a vortex flow by feeding the sheath flow tangentially to the saturator's (21) lower part.

4. Method according to any of the preceding claims 1 - 3, **characterized** in that the sheath flow in step c) is saturated by forming it to a vortex flow, which vortex flow flows along the moist inner lining (21a) of the saturator (21).

5. Method according to any of the preceding claims 1 - 4 , **characterized** in that the vortex flow is formed to circulate around the flow divider (25).

6. Method according to claim 1, **characterized** in that the saturated sheath flow in step d) is brought to a vortex flow by a vortex generating means (33, 35).

7. Method according to claim 6 , **characterized** in that the vortex generating means includes a flow guide (35) which is stationary or rotating.

8. Method according to claim 6, **characterized** in that the vortex flow has an invard motion, which keeps the particles in the sample flow in the center of the condenser (22).

9. Method according to any of the preceding claims 1 – 8, **characterized** in that the vortex flow is formed in saturator (21) and condenser (22) that are placed on top of each other.

10. Method according to claim 9, **characterized** in that the vortex flow is formed in saturator (21) and condenser (22) that are cylindrical.

11. Method according to any of the preceding claims 1 - 10, **characterized** in that the sample flow is introduced to the center of the saturated sheath flow by a flow divider (25), that is situated in the centre of saturator (21) and condenser (22).

12. Apparatus for increasing the size of small particles for a condensation particle counter (20), the apparatus comprising

a) a flow divider (25) for dividing the aerosol flow to a sample flow and a sheath flow,

b) a filter (26) for filtering the sheath flow,

c) a saturator (21) for saturating the filtered sheath flow with vapor and

d) a condenser (22), where the sample flow is introduced to the saturated sheath flow to condense the vapor in the sheath flow on the particles in the sample flow thus increasing the size of the particles,

characterized in that

the saturator (21) has means (32) to form the sheath flow to a vortex flow, which vortex flow is arranged to continue in the condenser (22) and the sample flow is arranged to be introduced to the center of the saturated sheath flow.

13. Apparatus according to claim12, **characterized** in that the vortex flow is a spiral flow, that is arranged to flow upwardly along the inner surfaces of the saturator (21) and/or condenser (22).

14. Apparatus according to claim 12 or 13, **characterized** in that means (32) to form the sheath flow to a vortex flow in the saturator (21) include a pipe (32), that is arranged tangentially to the lower part of the saturator (21).

15. Apparatus according to any of the preceding claims 12 -14, **characterized** in that the inner lining (21a) of the saturator (21) is moistened with liquid and that the sheath flow in step c) is arranged to be saturated by forming it to a vortex flow, which vortex flow is arranged to flow along the moist inner lining (21a) of the saturator (21).

16. Apparatus according to claim 12, **characterized** in that the condenser (22) comprises a vortex generating means (33, 35), for forming the vortex flow of the saturated sheath flow in step d).

17. Apparatus according to claim 16, **characterized** in that the vortex generating means includes a stationary or a rotating flow guide (35).

18. Apparatus according to any of the preceding claims 12 – 17, **characterized** in that the saturator (21) and the condenser (22) are placed on top of each other.

19. Apparatus according to claim 18, **characterized** in that the saturator (21) and the condenser (22) are cylindrical.

20. Apparatus according to any of the preceding claims 12 - 19, **characterized** in that the flow divider (25) is arranged in the center of the

saturator (21) and condenser (22) and that the flow divider (25) extends through the height of the saturator (21) and it ends inside the condenser (22).

21. Apparatus according to claim 12 or 20, **characterized** in that the flow divider (25) comprises a sample flow capillary (25c), for feeding the sample flow to the condenser (22) to the center of the saturated sheath flow.